ABSTRACT OF THE DISCLOSURE

A symbol timing derivation system derives receiver timing from received symbols which avoids the need for a pilot tone, thereby reducing power consumption and expanding usable bandwidth. The system is implemented by using a calculation that

5   finds the timing phase error. The timing phase error is then averaged and controls a phase locked loop (PLL). This PLL in turn controls a voltage-controlled oscillator, which handles the modem receiver timing. A centroid calculation can be included to bias the voltage-controlled oscillator to push the equalizer coefficients back to the ideal position. The system can be implemented in either a point-to-point modem environment

10   or a multi-point environment, for example, but not limited to, MVL or DMT. The voltage-controlled oscillator may also be implemented to control transmitter timing, so that the central office modem and the remote modem will operate more-or-less synchronously, reducing the need for large equalizer corrections at either end.